What is claimed is:

1. A method for regulating the structure of a macromolecule-lipid complex having:
   a. a selected characteristic or multiple selected characteristics from the group of macromolecule interaxial distance (d_M), membrane thickness of the lipid combination (δ_m), macromolecule area (A_M), macromolecule density (ρ_M), lipid density (ρ_L), and the ratio (L/D) between the weight of the lipid combination (L) and the weight of the macromolecule (D); and
   b. a charged macromolecule and lipid combination;

   the method comprising selecting the characteristic or characteristics from the group and modulating one or more of the non-selected characteristics from the group so as to produce the macromolecule-lipid complex having the desired structure.

2. A method for regulating the structure of a macromolecule-lipid complex comprising:
   a. selecting a charged macromolecule;
   b. selecting a charged lipid combination; the charge of the lipid combination being opposite of the charge of the macromolecule;
   c. determining an amount of the macromolecule and the lipid combination sufficient to regulate the structure of the complex by:
      i. selecting a characteristic or multiple characteristics of the complex from a group of characteristics consisting of macromolecule interaxial distance (d_M), membrane thickness of the lipid combination (δ_m), macromolecule area (A_M), macromolecule density (ρ_M), lipid density (ρ_L), and the ratio (L/D) between the weight of the lipid combination (L) and the weight of the macromolecule (D); and
      ii. modulating any of the characteristics not selected in (i) so as to achieve the selected characteristic thereby determining the amount of the macromolecule and lipid combination sufficient to regulate the structure of the complex; and

d. combining the macromolecule with the lipid combination in the amount so determined thereby resulting in the complex having the desired structure.

3. A method for regulating the interaxial distance of adjacent macromolecules within a macromolecule-lipid complex comprising:

a. selecting a charged macromolecule;

b. selecting a charged lipid combination; the charge of the lipid combination being opposite of the charge of the macromolecule;

c. determining an amount of the macromolecule of (a) and the lipid combination of (b) sufficient to regulate the structure of the complex by:

i. selecting a desired macromolecule interaxial distance (d_M); and

ii. modulating any of membrane thickness of the lipid combination (δ_M), macromolecule area (A_M), macromolecule density (ρ_M), lipid density (ρ_L), and the ratio (L/D) between the weight of the lipid combination (L) and the weight of the macromolecule (D) so as to achieve the desired macromolecule interaxial distance; and

d. combining the macromolecule with the lipid combination in the amounts so determined so as to produce the complex having the desired structure.

4. A method for regulating the density of macromolecules within a macromolecule-lipid complex comprising:

a. selecting a charged macromolecule;

b. selecting a lipid combination; the charge of the lipid combination being opposite of the charge of the macromolecule;

c. determining an amount of the macromolecule of (a) and the lipid combination of (b) sufficient to regulate the structure of the complex by:

i. selecting a desired macromolecule density; and

ii. modulating any of membrane thickness of the lipid combination (δ_M), macromolecule area (A_M), macromolecule interaxial distance, lipid density (ρ_L), and the ratio (L/D) between the weight of the lipid

combination (L) and the weight of the macromolecule (D) so as to achieve the desired macromolecule density,

d. combining the macromolecule with the lipid combination in the amount so determined so as to produce the complex having the desired structure.

5. The method of claim 1 or 2, wherein the characteristic so selected from group is macromolecule interaxial distance or macromolecule density.

6. The method of claim 1 or 2, wherein the characteristics so selected from the group are macromolecule interaxial distance and macromolecule density.

7. The method of claim 1, 2, 3, or 4, wherein modulating is effected using the formula: $d_M = (L/D)\ (A_M\rho_M)/(\delta_m\rho_L)$.

8. The method of claim 1 or 2, wherein the macromolecule is a charged macromolecule and the charge of the lipid combination is opposite of the charge of the macromolecule.

9. The method of claim 1, 2, 3, or 4, wherein the macromolecule is a nucleic acid molecule.

10. The method of claim 1, 2, 3, or 4, wherein the macromolecule may be linear, circular, nicked circular or supercoiled.

11. The method of claim 10, wherein the nucleic acid molecule is a DNA or RNA.

12. The method of claim 1, 2, 3, or 4, wherein the macromolecule is a peptide, protein, polysaccharide, a combination of a protein and carbohydrate moiety.

13. The method of claim 1, 2, 3, or 4, wherein the lipid combination comprises a neutral lipid component and a charged lipid component.

14. The method of claim 1, 2, 3, or 4, wherein the lipid combination and the macromolecule are associated so as to form a complex in an isoelectric point state.

15. The method of claim 1, 2, 3, or 4, wherein the lipid combination and the macromolecule are associated so as to form a complex in a positively charged state.

16. The method of claim 1, 2, 3, or 4, wherein the lipid combination and the macromolecule are associated so as to form a complex in a negatively charged state.

17. The method of claim 13, wherein the neutral lipid is dioleoyl phosphatidyl cholin (DOPC) or 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE).

18. The method of claim 13, wherein the charged lipid is 1,2-diacyl-3-trimethylammonium-propane (DOTAP).

19. The method of claim 1, 2, 3, or 4, wherein the macromolecule-lipid complex is a multilamellar structure wherein the lipid combination forms alternating lipid bilayers and macromolecule monolayers.

20. The method of claim 1, 2, 3, or 4, wherein the macromolecule-lipid complex forms either an inverted hexagonal complex phase or a regular hexagonal complex phase.

21. A macromolecule-lipid complex produced by the method of claim 1, 2, 3, or 4.

22. The macromolecule-lipid complex of claim 21, wherein the macromolecule comprises:

i. a lipid combination having a charged lipid component and a neutral lipid component; and

ii. a charged macromolecule;

the charge of the lipid combination being opposite of the charge of the macromolecule; the lipid and the macromolecule being associated so as to form a

complex in an isoelectric point state, wherein lipid combination forms a bilayer membrane to which the charged macromolecules are associated in an isoelectric point state, wherein the relative amounts of the neutral lipid component relative to the charged lipid component generates the lipid bilayer membrane having a thickness of between 25 and 75 angstroms.

23. A macromolecule-lipid complex of claim 21, wherein the complex comprises:

i. a charged lipid combination; and

ii. a charged macromolecule;

the charge of the lipid combination being opposite of the charge of the nucleic acid molecule; the lipid and the macromolecule being associated so as to form a complex in an isoelectric point state, wherein:

a. the lipids form a bilayer membrane to which the macromolecule is associated, wherein the relative amounts of the lipid components generate the lipid bilayer membrane having a thickness of between 25 and 75 angstroms; and

b. the conformation of the complex has macromolecule exhibiting interaxial spacing of a range between 50 and 75 angstroms.

24. A method for creating a pattern on a surface comprising:

a. selecting a charged macromolecule;

b. selecting a lipid combination;

c. determining an amount of the macromolecule of (a) and the lipid combination of (b) sufficient to regulate the structure of the complex by:

i. selecting a desired macromolecule density or interaxial distance; and

ii. modulating any of membrane thickness of the lipid combination (δ_m), macromolecule area (A_M), lipid density (ρ_L), and the ratio (L/D) between the weight of the lipid combination (L) and the weight of the macromolecule (D) so as to achieve the desired macromolecule density or interaxial distance thereby determining the amount of the macromolecule and lipid combination sufficient to regulate the structure of the complex;

d. applying the lipid combination on the surface in amount so determined; and

e. applying the macromolecule over the lipid combination of (a) in the amount so determined, wherein the macromolecule self assembles onto the lipid combination thereby forming a complex and creating a pattern on the surface.

25. The method of claim 24, wherein the pattern is used to create a mask.

26. A method for creating a material having desired properties comprising:

a. applying a macromolecule-lipid complex to a surface by the method of claim 24;

b. applying molecules which make up the material onto the complex of (a), wherein the molecules self-assemble based on its interactions with the complex; and

c. removing the complex from the surface thereby creating the material having the regulated structure.

27. The method of claim 26, wherein the complex is in a multilamellar, regular hexagonal, or inverted hexagonal phase.

28. The method of claim 26, wherein the material so created is a molecular sieve for separating molecules based on size.

29. A molecular sieve produced by the method of claim 26.

30. The method of claim 24, wherein modulating is effected using the formula: $d_M = (L/D)(A_M\rho_M)/(\delta_m\rho_L)$.

31. A macromolecule-lipid complex, the complex comprising a macromolecule(s), lipid or lipid combination, and a cosurfactant(s) molecule.

32. The macromolecule-lipid complex of claim 31, wherein the charge of the macromolecule is opposite to the charge of the lipid.

33. The macromolecule-lipid complex of claim 31, wherein the lipid is a neutral lipid and is selected from a group consisting of dioleoyl phosphatidyl cholin, 1,2-dioleoyl-sn-glycero-3-phosphoethanolamine, 1,2-dicaproyl-sn-glycero-3-phosphoethanolamine, 1,2-dioctanoyl-sn-glycero-3-phosphoethanolamine, 1,2-dicapryl-sn-glycero-3-phosphoethanolamine, 1,2-dilauroyl-sn-glycero-3-phosphoethanolamine, 1,2-dimyristoyl-sn-glycero-3-phosphoethanolamine, 1,2-dipentadecanoyl-sn-glycero-3-phosphoethanolamine, 1,2-dipalmitoyl-sn-glycero-3-phosphoethanolamine, 1,2-diphytanoyl-sn-glycero-3-phosphoethanolamine, 1,2-dipalmitoleoyl-sn-glycero-3-phosphoethanolamine, 1,2-distearoyl-sn-glycero-3-phosphoethanolamine, 1,2-dipretrselinoyl-sn-glycero-3-phosphoethanolamine, 1,2-dielaidoyl-sn-glycero-3-phosphoethanolamine, 1,2-dilauroyl-sn-glycero-3-phosphoethanolamine, 1,2-dilinoleoyl-sn-glycero-3-phosphoethanolamine, 1,2-dilinolenoyl-sn-glycero-3-phosphoethanolamine, 1,2-diarachidonoyl-sn-glycero-3-phosphoethanolamine, 1,2-docosahexaenoyl-sn-glycero-3-phosphoethanolamine, 1,2-myristoleoyl-sn-glycero-3-phosphocholine, 1,2-dimyristelaidoyl-sn-glycero-3-phosphocholine, 1,2-palmitoleoyl-sn-glycero-3-phosphocholine, 1,2-palmitelaidoyl-sn-glycero-3-phosphocholine, 1,2-petroselinoyl-sn-glycero-3-phosphocholine, 1,2-dioleoyl-sn-glycero-3-phosphocholine, 1,2-dielaidoyl-sn-glycero-3-phosphocholine, 1,2-dilinoleoyl-sn-glycero-3-phosphocholine, 1,2-linolenoyl-sn-glycero-3-phosphocholine, 1,2-eicosenoyl-sn-glycero-3-phosphocholine, 1,2-arachidonoyl-sn-glycero-3-phosphocholine, 1,2-erucoyl-sn-glycero-3-phosphocholine, 1,2-nervonoyl-sn-glycero-3-phosphocholine, 1,2-propionoyl-sn-glycero-3-phosphocholine, 1,2-butyroyl-sn-glycero-3-phosphocholine, 1,2-valeroyl-sn-glycero-3-phosphocholine, 1,2-caproyl-sn-glycero-3-phosphocholine, 1,2-heptanoyl-sn-glycero-3-phosphocholine, 1,2-capryloyl-sn-glycero-3-phosphocholine, 1,2-nonanoyl-sn-glycero-3-phosphocholine, 1,2-capryl-sn-glycero-3-phosphocholine, 1,2-undecanoyl-sn-glycero-3-phosphocholine, 1,2-lauroyl-sn-glycero-3-phosphocholine, 1,2-tridecanoyl-sn-glycero-3-phosphocholine, 1,2-myristoyl-sn-glycero-3-phosphocholine, 1,2-pentadecanoyl-sn-glycero-3-phosphocholine, 1,2-palmitoyl-sn-glycero-3-phosphocholine, 1,2-phytanoyl-sn-glycero-3-phosphocholine, 1,2-heptadecanoyl-sn-glycero-3-phosphocholine, 1,2-stearoyl-

sn-glycero-3-phosphocholine, 1,2-bromostearoyl-sn-glycero-3-phosphocholine, 1,2-nonadecanoyl-sn-glycero-3-phosphocholine, 1,2-arachidoyl-sn-glycero-3-phosphocholine, 1,2-heneicosanoyl-sn-glycero-3-phosphocholine, 1,2-behenoyl-sn-glycero-3-phosphocholine, 1,2-tricosanoyl-sn-glycero-3-phosphocholine, 1,2-lignoceroyl-sn-glycero-3-phosphocholine.

34. The macromolecule-lipid complex of claim 31, wherein the lipid is a charged lipid and is selected from a group consisting of 1,2-diacyl-3-trimethylammonium-propane, 1,2-dimyristoyl-3-trimethylammonium-propane, 1,2-dipalmitoyl-3-trimethylammonium-propane, 1,2-distearoyl-3-trimethylammonium-propane, 1,2-diacyl-3-dimethylammonium-propane, 1,2-dimyristoyl-3-dimethylammonium-propane, 1,2-dipalmitoyl-3-dimethylammonium-propane, 1,2-distearoyl-3-dimethylammonium-propane, and 1,2-dioleoyl-3-dimethylammonium-propane.

35. The macromolecule-lipid complex of claim 31, wherein the cosurfactant molecule is an alcohol and the alcohol is selected from a group consisting of butanol, pentanol, hexanol, heptanol, octanol, nonanol, and geraniol.

36. The macromolecule-lipid complex of claim 31, wherein the macromolecule is selected from the group consisting of nucleic acid molecules, proteins, peptides, immunomodulating compounds, glycoproteins, lipoproteins, hormones, neurotransmitters, tumoricidal agents, growth factors, toxins, analgesics, anesthetics, monosaccharides, polysaccharides, narcotics, catalysts, enzymes, antimicrobial agents, anti-inflammatory agents, anti-parasitic agents, dyes, radiolabels, radio-opaque compounds, and fluorescent compounds.

37. A method for creating a macromolecule-lipid complex in an hexagonal phase, the method comprising:

a. determining an amount of the lipid or lipid combination by selecting a lipid or lipid combination where the sum of the products of the spontaneous curvature for each lipid and the volume fraction for each lipid is greater than zero, and

b. adding a macromolecule to the lipid or lipid combination determined in step a under sufficient conditions to create the macromolecule-lipid complex in the hexagonal phase.

38. A method for creating a macromolecule-lipid complex in an inverted hexagonal phase, the method comprising:

a. determining an amount of the lipid or lipid combination by selecting a lipid or lipid combination where the sum of the products of the spontaneous curvature for each lipid and the volume fraction for each lipid is less than zero, and

b. adding a macromolecule to the lipid or lipid combination determined in step a under sufficient conditions to create the macromolecule-lipid complex in the inverted hexagonal phase.

39. A method for creating a macromolecule-lipid complex in a lamellar phase, the method comprising:

a. determining an amount of the lipid or lipid combination by selecting a lipid or lipid combination where the sum of the products of the spontaneous curvature for each lipid and the volume fraction for each lipid is zero, and

b. adding a macromolecule to the lipid or lipid combination determined in step a under sufficient conditions to create the macromolecule-lipid complex in the lamellar phase.

40. The method of claim 37, 38, or 39, wherein the volume fraction of the lipid is determined from Figure 3 for each phase.

41. The method of claim 37 or 38, wherein the volume fraction of the lipid is greater than 0.6.

42. The method of claim 39, wherein the volume fraction of the lipid is greater than 0.7 and less than 0.85.

43. The method of claim 39, wherein the volume fraction of the lipid is less than 0.4.

44. The method of claim 37, 38, or 39 further comprising the step of adding a cosurfactant molecule to the complex so created.

45. A method for making a macromolecule-lipid complex in any of a lamellar, hexagonal, or inverted hexagonal phase, the complex having a lipid or lipid combination, a macromolecule(s), and a cosurfactant(s), the method comprising:

a. selecting the lipid or lipid combination and macromolecule(s); and

b. determining the membrane bending rigidity of the lipid or lipid combination and macromolecule(s) so that the cosurfactant(s) and its amount can be determined, such that the cosurfactant so determined will result in an alteration to the membrane bending rigidity, so as to result in any of the lamellar, hexagonal, or inverted hexagonal phase and the spontaneous curvature of the membrane zero or non-zero.

46. A macromolecule-lipid complex produced by the method of claim 37, 38, 39 or 45.

47. A method for transferring the macromolecule in the macromolecule-lipid complex of claim 21, 31, or 46 to a cell comprising contacting the complex with the cell under sufficient conditions so that the macromolecule releases from the complex and transferring the macromolecule to the cell.

48. A lubricant composition comprising the macromolecule complex of claim 21, 31 or 46 and an acceptable carrier.

49. The lubricant composition of claim 48, wherein the lubricant exhibits liquid crystalline properties.

50. A method for reducing friction between two surfaces comprising contacting the surfaces with the liquid lubricant of claim 48 so as to reduce friction between the two surfaces when the surfaces are put in contact.

51. A method for creating a pattern on a surface comprising applying the macromolecule-lipid complex of claim 21, 31, or 46 on the surface thereby creating a pattern on the surface.

52. The method of claim 51, wherein the pattern is used to create a mask.

53. A method for creating a material having desired properties comprising:

a. applying a macromolecule-lipid complex to a surface by the method of claim 51;
b. applying the material onto the complex of (a), wherein the molecules self-assemble based on its interactions with the complex; and
c. removing the complex from the surface thereby creating the material having the regulated structure.

54. The method of claim 53, wherein the complex is in a multilamellar, regular hexagonal, or inverted hexagonal phase.

55. The method of claim 53, wherein the material so created is a molecular sieve for separating molecules based on size.